

Details Text Image HTML KWC



(43) Pub. Date: Jan. 17, 2002

(57) U.S. Cl. 430,270.1

(57) ABSTRACT

A positive type photoresist composition suitable for light in the wavelength region of 170 nm to 220 nm, high in sensitivity, excellent in adhesion and giving a good resist pattern profile, which comprises a resin having an ester group represented by the following general formula (I); its monomeric and a compound generating an acid by irradiation of an active light ray or radiation:

(22) Filed: Dec. 6, 2001

**Related U.S. Application Data**

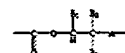
(13) Continuation of application No. 03UC3502, filed on Feb. 12, 1968, now Pat. No. 3,424,457.

(30) Foreign Application Priority Data

Feb. 17, 1937	(JP)	HEX 9-32431
Feb. 27, 1937	(JP)	HEX 9-33974
Mar. 3, 1937	(JP)	HEX 9-30555
Mar. 7, 1937	(JP)	HEX 9-31583

**Publication Classification**

(51) Int. Cl.<sup>7</sup> G03F 7/039



wherein  $R_1$  represents a hydrogen atom, an alkyl group or a cycloalkyl group, and  $R_2$  and  $R_3$  which may be the same or different, each represents a hydrogen atom, an alkyl group, a cycloalkyl group or  $-A-R_4$ , and  $R_4$  and  $R_5$  may combine together to form a ring, wherein  $R_1$  represents a hydrogen atom, an alkyl group or a cycloalkyl group,  $R_4$  and  $R_5$  or  $R_4$  may combine together to form a ring, and A represents an arylene group or a sulfonyl group.

Details Text Image HTML Full

US-PAT-NO: 6432616

DOCUMENT-IDENTIFIER: US 6432616 B1

TITLE: Water soluble polymer and photoresist composition containing the same

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## Detailed Description Text - DETX (9):

After the photoresist was stored for three months, the above-mentioned exposure evaluation was repeated. It was found that neither the resolution nor adhesion changed.



US 6,432,616 B1

(12) United States Patent  
Song et al.

(10) Patent No.: US 6,432,616 B1  
(45) Date of Patent: Aug. 13, 2002

(54) WATER SOLUBLE POLYMER AND  
PHOTORESIST COMPOSITION  
CONTAINING THE SAME

(73) Inventors: Ding-Dang Song, Taipei; Sheng-Jia Yang, The Yuan, Kuo-Mei Chen, Tzihua Liu, both of Hsinchu, all of (TW)

(72) Assignee: Industrial Technology Research Institute, Hsinchu (TW)

(\*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: 09/034,473

(22) Filed: Aug. 7, 2000

(30) Foreign Application Priority Data

Dec. 17, 1999 (TW) 8912229 A

(51) Int. Cl.<sup>7</sup> G03C 1/73, C08F 6/50, C08F 6/34, C08F 8/40, C08F 2/46

(52) U.S. Cl. 430/282.1; 430/281.1; 430/270.1; 430/202; 430/916; 525/325.3; 525/330.1; 525/363; 525/335; 522/65; 522/37; 522/40; 522/43; 522/44; 522/50; 522/53

(53) Field of Search 525/325.3, 530.1, 525/363, 525/335, 522/65, 522/37, 522/40, 522/43, 522/44, 522/50, 522/53, 430/282.1, 430/281.1, 430/270.1, 430/202, 430/916, 525/325.3, 525/330.1, 525/363, 525/335, 522/65, 522/37, 522/40, 522/43, 522/44, 522/50, 522/53

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(57) ABSTRACT

The present invention provides a water soluble polymer which is prepared by the following steps. First, a carboxyl group-containing polymer is reacted with an alkaline reagent so that a portion of the carboxyl groups are reacted in an anionic fashion to make the polymer water soluble. Then, the polymer obtained is reacted with an epoxide containing unsaturated bonds and/or transistors so that 1 to 100 mole percent of the remaining carboxyl group of the polymer are reacted with the epoxide to form ester groups via a ring-opening reaction of epoxide, wherein the bromination can be silicon, chlorine, phosphorus or sulfur. The water soluble polymer of the present invention can be used in a photo-sensitive resin. When the photoresist composition is used for preparing printed circuit boards, it exhibits high photosensitivity, good water dispersibility, storage stability, and good adhesion to copper. In addition, the problem of sticking to the mask can be prevented.

13 Claims, No Drawings

US-PAT-NO: 6372406

DOCUMENT-IDENTIFIER: US 6372406 B1

TITLE: Deactivated aromatic amines as additives in acid-catalyzed resists

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## Detailed Description Paragraph Table - DETL (2):

E.sub.0 The photoresist stored at 0.degree. C. for 15 days: 6.6 mJ/cm.sup.2  
 The photoresist stored at 40.degree. C. for 15 days: 5.2 mJ/cm.sup.2 (Change:  
 21%)

## Detailed Description Paragraph Table - DETL (4):

E.sub.0 The photoresist stored at 0.degree. C. for 15 days: 4.8 mJ/cm.sup.2  
 The photoresist stored at 40.degree. C. for 15 days: 4.2 mJ/cm.sup.2 (Change:  
 12.5%)

## Detailed Description Paragraph Table - DETL (6):

E.sub.0 The photoresist stored at 0.degree. C. for 15 days: 9.0 mJ/cm.sup.2  
 The photoresist stored at 40.degree. C. for 15 days: 9.0 mJ/cm.sup.2 (Change:  
 0%)



(12) United States Patent  
 Brunsfold et al.

(10) Patent No.: US 6,372,406 B1  
 (45) Date of Patent: Apr. 16, 2002

(54) DEACTIVATED AROMATIC AMINES AS  
 ADDITIVES IN ACID-CATALYZED RESISTS  
 (75) Inventors: William R. Brunsfold; Ahmad D.  
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 5,071,730 A 12/1992 Allen et al. 5,007,720  
 5,022,511 A 11/1994 Umehara et al. 4,922,772  
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 5,712,078 A 11/1998 Hwang et al. 4,502,701  
 5,776,682 A 11/1998 Hwang et al. 4,502,701

(73) Assignee: International Business Machines  
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 tivity and Orientation", Organic Chemistry, Boston, 1959,  
 Chapter 14, pp. 284-288 and Chapter 20, pp. 547-548.

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(21) Appl. No.: 08/704,662

(22) Filed: Nov. 6, 2000

Related U.S. Application Data

(43) Continuation of application No. 08/054,864, filed on Sep. 3,  
 1993

(51) Int. Cl. C09C 1/73

(52) U.S. Cl. 430/270.1; 430/281.1;  
 430/302; 430/314; 430/317; 430/320; 430/321;  
 430/323

(53) Field of Search 430/270.1, 314,  
 430/314, 315, 321, 323, 324.1

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5,071,730 A 12/1992 Allen et al. 5,007,720

5,022,511 A 11/1994 Umehara et al. 4,922,772

5,492,793 A 11/1996 Gupta et al. 6,302,704

5,541,808 A 11/1996 Watanabe et al. 4,502,179

5,712,078 A 11/1998 Hwang et al. 4,502,701

5,776,682 A 11/1998 Hwang et al. 4,502,701

6 Claims, No Drawings

Also the photoreactive solution can be stored for a long time without change of properties thereof since the initiator does not decompose Diazo photosensitizer.



(11) Patent Number: 6,127,074  
(45) Date of Patent: Oct. 3, 2000

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[57] ABSTRACT

[illegible]

The present invention relates to photoresist solutions for photolithography in the color cathode ray tube. The photoresist solution of the present invention comprises Diars or Biarside photoresist, polymer, which is mixed with acid Diars or Biarside photoresist, obtained by polymerization of triarys ethyl acrylate base. The photoresist solution of the present invention improves the adhesion strength by using of the Diars or Biarside photoresist and the polymer, that the glass, silica and phosphor screen being uniformly, formed and the color resistive being disappeared. Further, since the photoresist does not contain heavy metal, it does not cause any kind of pollution. Also, it can be stored for a long time by using the inhibitor without hydrochloric acid at the time of polymerization.

**12 Clauses, No Drawings**

## Detail Description Paragraph - DETX (17):

[0057] A solution of a base resin for the photoresist composition was prepared by dissolving, in 400 parts of propyleneglycol monomethyl ether acetate, 50 parts of the same first partially 1-ethoxyethyl-substituted polyhydroxystyrene resin as used in Reference Example 3 and 50 parts of a second partially substituted polyhydroxystyrene resin of which 25% of the hydroxyl groups were substituted by 1-ethoxyethyl groups, having a weight-average molecular weight of 5000 with a molecular weight dispersion of 1.2 and exhibiting a dissolving velocity of 150 nm/minute in a 2.38% by weight aqueous solution of tetramethylammonium hydroxide.

## Detail Description Paragraph - DETX (18):

[0058] A coating layer formed on a silicon wafer by coating with the above prepared solution of the base resin combination followed by drying exhibited a dissolving velocity of 40 nm/minute under the same testing conditions.

## Detail Description Paragraph - DETX (20):

[0059] A positive-working photoresist composition was prepared by dissolving, in 490 parts of propyleneglycol monomethyl ether acetate, 30 parts of the same combination of the two partially tert-butoxycarbonyl-substituted resin as in Reference Example 1, 70 parts of the same combination of the two partially 1-ethoxyethyl-substituted resin as in Reference Example 3, 7 parts of bis(cyclohexylsulfonyl) diazomethane, 0.1 part of triethylamine and 0.5 part of sulfonic acid followed by filtration of the solution through a membrane filter of 0.2  $\mu$ m pore diameter.

## Detail Description Paragraph - DETX (21):

[0060] This positive-working photoresist composition was subjected to the evaluation tests of the above described testing items (1) to (5) to obtain results including:

## Detail Description Paragraph - DETX (28):

[0066] The formulation of the positive-working photoresist composition and the



US 2002/0110750 A1

United States

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Sato et al.

(4) Pub. Date: Aug. 15, 2002

(54) POSITIVE-WORKING PHOTORESIST COMPOSITION

(30) Foreign Application Priority Data

Mar. 18, 1999 (JP) 11-74097

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Kazuyuki Fuku, Ebina-cho (JP)

Publication Classification

(51) Int. Cl.<sup>7</sup> G01F 7/028  
(52) U.S. Cl. 438/270.1; 438/272; 438/251;  
438/257.1; 438/259

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## ABSTRACT

Disclosed is a novel chemical-amplification positive-working photoresist composition capable of giving a patterned resist layer with excellent properties such as photosensitivity, pattern resolution, heat resistance and cross-sectional profile of the patterned resist layer. The composition is characterized by the use of, as the film-forming resinous component, a hydroxyl-containing aromatic compound which is a combination of a first resin of which from 30 to 50% of the hydroxyl groups are substituted by acid-labile alkoxy-protecting groups and a second resin of which from 5 to 20% of the hydroxyl groups are substituted by acid-labile groups of the same kind as in the first resin in a weight proportion of 1:9 to 9:1.

(21) Appl. No.: 10/114,258

(22) Filed: Apr. 3, 2002

Related U.S. Application Data

(42) Division of application No. 09/421,305, filed on Mar. 8, 2000.

to 0.22  $\mu\text{m}$  and a cross sectional profile of good orthogonality.

#### Summary of Invention Paragraph - BSTX (47):

[0044] In the following, the **positive**-working chemical-amplification **photoresist** composition of the present invention is described in more detail by way of Examples. In the following description, the term of "parts" always refers to "parts by weight".

#### Detail Description Paragraph - DETX (2):

[0045] A **positive**-working **photoresist** composition was prepared by uniformly dissolving, in 800 parts of propyleneglycol monoethyl ether acetate,

#### Detail Description Paragraph - DETX (3):

[0046] 60 parts of a first copolymeric **resin** referred to as the **resin** I hereinafter, having a weight-average molecular weight of 10,000 and consisting of 65% by moles of hydroxystyrene units, 20% by moles of styrene units and 15% by moles of tert-butyl acrylate units,

#### Detail Description Paragraph - DETX (4):

[0047] 40 parts of a second copolymeric **resin** referred to as the **resin** II hereinafter, having a weight-average molecular weight of 10,000 and consisting of 65% by moles of hydroxystyrene units, 30% by moles of styrene units and 5% by moles of tert-butyl acrylate units,

#### Detail Description Paragraph - DETX (7):

[0050] 0.5 part of **salicylic acid**

#### Detail Description Paragraph - DETX (9):

[0052] A semiconductor silicon wafer of 6 inches diameter after a treatment with hexamethyl disilazane was coated on a spinner with the above prepared **photoresist** solution followed by drying under heating on a hot plate at 130 degree C. for 90 seconds to give a dried **photoresist** layer having a

[0048] 3 parts of bis(4-tert-butylphenyl) iodonium nonafluorobutane sulfonate,

[0049] 0.5 part of triethanolamine, and

[0050] 0.5 part of salicylic acid,

[0051] followed by filtration of the solution through a membrane filter of 0.2  $\mu\text{m}$  pore diameter.

[0052] A semiconductor silicon wafer of 6 inches diameter after a treatment with hexamethyl disilazane was coated on a spinner with the above prepared photoresist solution followed by drying under heating on a hot plate at 130° C. for 90 seconds to give a dried photoresist layer having a thickness of 0.7  $\mu\text{m}$ . In the next place, the photoresist layer is exposed pattern-wise to a KrF excimer laser beam on a microlithography exposure machine (Model FPA-00EX3, manufactured by Canon Co.) followed by a post-exposure baking treatment at 120° C. for 90 seconds and then by a puddle development treatment at 23° C. for 65 seconds in a 2.38% by weight aqueous solution of tetramethylammonium hydroxide to give a positively patterned resist layer.

[0053] A fully resolved line-and-space pattern of 0.22  $\mu\text{m}$  line width could be obtained in this way. The thus patterned resist lines had an excellently orthogonal cross sectional profile standing upright on the substrate surface. The minimum exposure dose for obtaining the line-and-space resist pattern of 0.22  $\mu\text{m}$  width was 30 mJ/cm<sup>2</sup> as a measure of the cross-sensitivity. The critical pattern resolution was 0.19  $\mu\text{m}$ .

#### COMPARATIVE EXAMPLE 1

[0054] The experimental procedure was substantially the same as in Example 1 excepting for modification of the formulation of the photoresist composition by replacing the combination of 60 parts of the resin I and 40 parts of the resin II with 100 parts of a third copolymeric resin having a weight-average molecular weight of 10,000 and consisting of 55% by moles of hydroxystyrene units, 20% by moles of styrene units and 25% by moles of tert-butyl acrylate units.

[0055] The results of the evaluation tests of the patterned resist layer were that line-and-space patterns of a line width smaller than 0.25  $\mu\text{m}$  could not be obtained and the cross sectional profile of a line-patterned resist layer of 0.25  $\mu\text{m}$  line width was trapezoidal. The minimum exposure dose for obtaining the line-and-space pattern of 0.25  $\mu\text{m}$  line width was 30 mJ/cm<sup>2</sup>.

#### COMPARATIVE EXAMPLE 2

[0056] The experimental procedure was substantially the same as in Example 1 excepting for modification of the formulation of the photoresist composition by replacing bis(4-tert-butyl-phenyl) iodonium nonafluorobutane sul-

#### EXAMPLE 2

[0058] The experimental procedure was substantially the same as in Example 1 excepting for modification of the photoresist composition by increasing the amount of the resin I from 60 parts to 80 parts, decreasing the amount of the resin II from 40 parts to 20 parts, and adding an additional admixture of the composition with dimethylacetamide and for an increase of the prebaking temperature and post-exposure baking time from 130° C. to 140° C. and from 120° C. to 130° C. respectively.

[0059] The results of the evaluation tests of the resist layer were that a hole pattern of 0.20  $\mu\text{m}$  diameter could be obtained in this way. The thus formed hole pattern had an excellent cross sectional profile perpendicular to the substrate surface. The minimum exposure dose for obtaining the hole pattern of 0.20  $\mu\text{m}$  diameter was 40 mJ/cm<sup>2</sup> as a measure of the photosensitivity. The pattern resolution was 0.19  $\mu\text{m}$ .

#### COMPARATIVE EXAMPLE 3

[0060] The experimental procedure was substantially the same as in Example 2 excepting for modification of the photoresist composition by replacing the combination of 80 parts of the resin I and 20 parts of the resin II with 100 parts of the third copolymeric resin in Comparative Example 1.

[0061] The results of the evaluation tests of the resist layer were that hole patterns of 0.30  $\mu\text{m}$  diameter could not be obtained and the sensitivity for a 0.30  $\mu\text{m}$  hole pattern was 40 mJ/cm<sup>2</sup>.

#### COMPARATIVE EXAMPLE 4

[0062] The experimental procedure was substantially the same as in Example 2 excepting for modification of the photoresist composition by replacing bis(4-tert-butyl-phenyl) iodonium nonafluorobutane sulfonate with the same amount of triphenylsulfonium hexafluorophosphate.

[0063] The results of the evaluation tests of the resist layer were that hole patterns of 0.22  $\mu\text{m}$  diameter could not be obtained and the sensitivity for a 0.22  $\mu\text{m}$  hole pattern, i.e. the minimum exposure dose, was 40 mJ/cm<sup>2</sup>, although the cross sectional profile of the hole pattern was good perpendicularly reaching the surface.

What is claimed is:

1. A positive-working chemical-amplification photoresist composition which comprises, as a uniform solution in an organic solvent:

patterned resist layer and stability of the latent images before development, that the ~~photoresist~~ composition further contains an aliphatic tertiary amine compound as a component (C). Examples of preferable aliphatic tertiary amine compounds include trimethylamine, triethylamine, tripropylamine, tributylamine, triphenylamine, triethanolamine, tributanolamine and the like, of which triethanolamine is particularly preferable although any of these amine compounds can be used either singly or as a combination of two kinds or more according to need.

#### Detailed Description Text - DETX (13):

While additional addition of the above mentioned amine compound to the inventive ~~photoresist~~ composition may eventually have a disadvantageous effect of decreasing the photosensitivity of the composition, this disadvantage can be overcome, along with a beneficial effect of improving the pattern resolution, by the admixture of a carboxylic acid as a component (D) in combination with the component (C). Preferable carboxylic acids suitable for this purpose include aliphatic saturated dicarboxylic acids and aromatic carboxylic acids.

#### Detailed Description Text - DETX (14):

Examples of suitable aliphatic saturated dicarboxylic acids include oxalic, malonic, succinic and glutaric acids. Examples of suitable aromatic carboxylic acids include aromatic mono- and polycarboxylic acids having a hydroxyl or nitro group as a substituent group such as 2-hydroxy benzoic acid, 4-hydroxy benzoic acid, 2-hydroxy-3-nitro benzoic acid, 3,5-dinitro benzoic acid, 2-nitro benzoic acid, 2,4-dihydroxy benzoic acid, 2,5-dihydroxy benzoic acid, 2,6-dihydroxy benzoic acid, 3,4-dihydroxy benzoic acid, 3,5-dihydroxy benzoic acid, 2-vinyl benzoic acid, 4-vinyl benzoic acid, phthalic acid, terephthalic acid and isophthalic acid. These carboxylic acids can be used either singly or as a combination of two kinds or more according to need. Among the above named carboxylic acids, 2-hydroxy benzoic acid, i.e. ~~salicylic acid~~ and malonic acid are particularly preferable.

#### Detailed Description Text - DETX (15):

As to the amount of the optional component (C) in the inventive ~~photoresist~~ composition, the amine compound is added to the composition in an amount in the range from 0.001 to 10 parts by weight or, preferably, from 0.01 to 1.0 part by weight per 100 parts by weight of the component (A) in consideration of orthogonality of the cross sectional profile of the resist pattern, stability of the latent images before development and photo sensitivity of the composition.

#### Detailed Description Text - DETX (16):

The amount of the carboxylic acid as the component (D), when added to the inventive ~~photoresist~~ composition, is in the range from 0.001 to 10 parts by weight or, preferably, from 0.01 to 1.0 part by weight per 100 parts by weight of the component (A). Addition of the component (D) to the inventive ~~photoresist~~ composition has an effect of preventing a decrease in the photo sensitivity of the composition as a side effect of the component (C) along with further improvement of orthogonality of the cross sectional profile of the patterned resist layer.

layer by a development treatment is the compound above to give a patterned resist layer having an essentially orthogonal cross sectional profile.

In the inventive photoresist composition comprising the copolymeric resins as the component (A), which can be either one or a combination of two kinds or more of copolymeric resin having the definition of the above described tertiary copolymeric resin, it is preferable that the component (A) is a combination of a first copolymeric resin (A1) consisting of from 51 to 99% by moles of the monomeric units of the first class (A), from 15 to 35% by moles of the monomeric units of the second class (B) and from 12 to 18% by moles of the monomeric units of the third class (C) and a second copolymeric resin (A2) consisting of from 49 to 49% by moles of the monomeric units of the first class (A), from 12 to 35% by moles of the monomeric units of the second class (B) and from 2 to 18% by moles of the monomeric units of the third class (C) in a weight proportion in the range from 9:1 to 5:5 or, preferably, from 5:1 to 4:4 in respect of the copolymerizability, pattern resolution and orthogonality of the cross sectional profile of the patterned resist layer.

It is preferable that the copolymeric resin as the component (A) has a weight-average molecular weight in the range from 5000 to 30000 as determined by the gel permeation chromatography (GPC) method by using reference to known polystyrene resins. When the weight-average molecular weight of the component (A) is too low, the photoresist composition cannot be fully film-forming while, when the weight-average molecular weight of the resin is too high, the resin cannot be fully soluble in an aqueous alkaline solution.

The component (B) contained in the inventive photoresist composition is combination with the above described component (A) is a radiation-sensitive acid-generating agent which is a compound capable of releasing an acid by decomposition under irradiation with active rays such as ultraviolet light. The acid-generating agent in the inventive photoresist composition is not particularly restrictive and can be selected from known ones. It is preferable to select acid compound consisting a fluoroalkyl sulfonium ion of 1 to 10 carbon atoms as the cation.

The cation as the counter ion of the above mentioned anion of the cation salt compound is not particularly restrictive and can be selected from known ones. Suitable cations include, for example, phenyl iodolium and sulfonium ions which may optionally be substituted by a lower alkyl group such as methyl, ethyl, propyl, n-butyl, and isobutyl groups or a lower alkoxy group such as methoxy and ethoxy groups.

On the other hand, the anion of the cation salt compound is a fluoroalkyl sulfonate ion obtained by substituting fluorine atoms for a part or all of the hydrogen atoms in an alkyl group of 1 to 10 carbon atoms. It is preferable that the alkyl group in the fluoroalkyl sulfonate ion has 1 to 5 carbon atoms and all of the hydrogen atoms thereof are replaced with fluorine atoms since the acid strength of the sulfonate ion as a trifluoromethyl acid is decreased as the chain length of the alkyl group is increased and the degree of fluorination of the alkyl group is decreased.

Particular examples of the cation salt compounds suitable as the component (B) in the inventive photoresist composition include triphenylsulfonium trifluoromethanesulfonate or nonafluorobutanesulfonate, bis(4-methylphenyl) sulfonium trifluoromethanesulfonate or nonafluorobutanesulfonate, triphenylsulfonium hexafluoroantimonate or nonafluorobutanesulfonate and tri(4-methylphenyl) sulfonium trifluoromethanesulfonate or nonafluorobutanesulfonate.

fluorobutanesulfonate. Any of the above cation salt compounds can be used either singly or as a combination of two kinds or more according to need.

The amount of the cation salt compound as the component (B) in the inventive photoresist composition is in the range from 1 to 10 parts by weight per 100 parts by weight of the component (A). When the amount of the component (B) is too small, good pattern formation can hardly be accomplished while, when the amount of the component (B) is too large, a photoresist composition in the form of a solution cannot be obtained due to the limited solubility of the compound in an organic solvent to cause a decrease in storage stability of the photoresist mixture.

While the essential ingredients in the inventive photoresist composition are the above described components (A) and (B), it is optional, if necessary with an object to improve orthogonality of the cross sectional profile of the patterned resist layer and stability of the latent images before development, that the photoresist composition further contains an aliphatic tertiary amine compound as a component (C). Examples of preferable aliphatic tertiary amine compounds include trimethylamine, triethylamine, tripropylamine, tributylamine, triphenylamine, triethanolamine, tributanolamine and the like, of which triethanolamine is particularly preferable although any of these amine compounds can be used either singly or as a combination of two kinds or more according to need.

While additional addition of the above mentioned amine compound to the inventive photoresist composition may eventually have a disadvantageous effect of decreasing the photosensitivity of the composition, this disadvantage can be overcome, along with a beneficial effect of improving the pattern resolution, by the admixture of a carboxylic acid as a component (D) in combination with the component (C). Preferable carboxylic acids suitable for this purpose include aliphatic saturated dicarboxylic acids and aromatic carboxylic acids.

Examples of suitable aliphatic saturated dicarboxylic acids include oxalic, malonic, succinic and glutaric acids. Examples of suitable aromatic carboxylic acids include aromatic mono- and polycarboxylic acids having a hydroxyl or nitro group as a substituent group such as 2-hydroxy benzoic acid, 4-hydroxy benzoic acid, 2-hydroxy-3-nitro benzoic acid, 3,5-dinitro benzoic acid, 2-nitro benzoic acid, 2,4-dihydroxy benzoic acid, 2,5-dihydroxy benzoic acid, 2,6-dihydroxy benzoic acid, 3,4-dihydroxy benzoic acid, 3,5-dihydroxy benzoic acid, 2-vinyl benzoic acid, 4-vinyl benzoic acid, phthalic acid, terephthalic acid and isophthalic acid. These carboxylic acids can be used either singly or as a combination of two kinds or more according to need. Among the above named carboxylic acids, 2-hydroxy benzoic acid, i.e. ~~salicylic acid~~ and malonic acid are particularly preferable.

As to the amount of the optional component (C) in the inventive photoresist composition, the amine compound is added to the composition in an amount in the range from 0.001 to 10 parts by weight or, preferably, from 0.01 to 1.0 part by weight per 100 parts by weight of the component (A) in consideration of orthogonality of the cross sectional profile of the resist pattern, stability of the latent images before development and photo sensitivity of the composition.

The amount of the carboxylic acid as the component (D), when added to the inventive photoresist composition, is in the range from 0.001 to 10 parts by weight or, preferably, from 0.01 to 1.0 part by weight per 100 parts by weight of the component (A). Addition of the component (D) to the

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US-PAT-NO: 5498765

DOCUMENT-IDENTIFIER: US

TITLE: Positive photoresist composition containing photoacid generator and use thereof

----- KWIC -----

TITLE - TI (1):

Positive photoresist composition containing photoacid generator and use thereof

Abstract Text - ABTX (1):

A positive acting photoresist comprising a film forming reactive polymer; an iodonium initiator or a non-ionic compound that generates triflic acid upon exposure to radiation; and a multifunctional organic carboxylic acid is provided as well as use thereof.

Brief Summary Text - BSTX (3):

The present invention relates generally to mixtures of polymers and iodonium photoacid generators or non-ionic triflic acid generators used in resist compositions and, more specifically, to improved photoresist compositions for use in printed circuit board manufacture which function via an acid-catalyzed deprotection mechanism. More particularly, multifunctional organic carboxylic acids are employed in the compositions of the present invention to substantially reduce, if not entirely eliminate undevelopable resist and aid in the strippability of the resist.

Brief Summary Text - BSTX (5):

The design of chemically amplified resist systems based on acid-catalyzed chain reactions (e.g., polymerization, depolymerization, side chain- cleavage, etc.) has been recognized as a viable route to-high sensitivity resist systems in microlithography. Such systems are described in, e.g., Polymer In Electronics, Davidson T. Ed., ACS Symposium Series 242, American Chemical Society, Washington, D.C., 1984, page 11, H. Ito, C. G. Willson. These systems

ates Patent (15)

(11) Patent Number: 5,498,765

(45) Date of Patent: Mar. 12, 1996

(54) POSITIVE PHOTORESIST COMPOSITION CONTAINING PHOTOACID GENERATOR AND USE THEREOF

(57) Field of Search: 430721, 326, 430729, 270, 510, 514, 929, 933, 277, 32225, 26

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(21) Appl. No.: 811477

(22) Filed: Sep. 26, 1994

Related U.S. Application Data

(62) Division of Ser. No. 41,462, Apr. 7, 1993, Pat. No. 5,374, 800

(51) Int. Cl.<sup>6</sup>: G03F 7/00; G03F 7/40

(52) U.S. Cl.: 438022; 430726; 430723

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ABSTRACT

A positive acting photoresist comprising a film forming reactive polymer, an iodonium initiator or a non-ionic compound that generates triflic acid upon exposure to radiation, and a multifunctional organic carboxylic acid is provided as well as use thereof.

13 Claims, No Drawings

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